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NASA-08120 (June 2003)
NATIONAL AERONAUTICS **NASA**
AND SPACE ADMINISTRATION **SUPERSEDING NASA-08120**
(March 2003)

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SECTION 08120

ALUMINUM DOORS AND FRAMES
06/03

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NOTE: Delete, revise, or add to the text in this section to cover project requirements. Notes are for designer information and will not appear in the final project specification.

This section covers swing-type medium stile doors and flush glazed frames.

Drawings must include the following:

Arrangement of frames, dimensions, shapes and sizes of members, elevations, connections, and the relation of frames to other building components

Size, thickness, and hand of doors

Anchorage devices embedded in other construction

Sealing perimeter joints between frames and adjacent construction is specified in Section 07920, "Sealants and Calkings."

Glass and installation are specified in Section 08810, "Glass."

Finish hardware items not provided with doors and frames, such as floor- or wall-mounted door stops, are specified in Section 08711, "Hanging Hardware."

****

PART 1 GENERAL

1.1 REFERENCES

****

NOTE: The following references should not be manually edited except to add new references. References not used in the text will automatically be deleted from this section of the project specification.

****

The publications listed below form a part of this section to the extent referenced:

ALUMINUM ASSOCIATION (AA)

AA 45	(1997) Designation System for Aluminum Finishes
AA SAS-30	(1986) Specifications for Aluminum Structures Construction Manual Series Section 1

AMERICAN INSTITUTE OF STEEL CONSTRUCTION (AISC)

AISC 350	(1986) Specification for Structural Steel Buildings Load and Resistance Factor Design

AMERICAN IRON AND STEEL INSTITUTE (AISI)

AISI SG-671	(1986; Addendum 1989) Specification for the Design of Cold-Formed Steel Structural Members

AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI)

ANSI B18.22.1	(1975; R 1998) Plain Washers
ANSI B18.22M	(1981; R 2000) Metric Plain Washers

AMERICAN WELDING SOCIETY (AWS)

AWS A2.4	(1993) Standard Symbols for Welding, Brazing and Nondestructive Examination
AWS A5.1	(1991) Specification for Carbon Steel Electrodes for Shielded Metal Arc Welding
AWS D1.1/D1.1M	(2002) Structural Welding Code - Steel

ASTM INTERNATIONAL (ASTM)

ASTM A 123/A 123M	(2002) Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
ASTM A 153/A 153M	(2001a) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware
ASTM A 27/A 27M	(2000) Standard Specification for Steel Castings, Carbon, for General Application

ASTM A 283/A 283M	(2000) Standard Specification for Low and Intermediate Tensile Strength Carbon Steel Plates
ASTM A 307	(2000) Standard Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile Strength
ASTM A 36/A 36M	(2001) Standard Specification for Carbon Structural Steel
ASTM A 47/A 47M	(1999) Standard Specification for Ferritic Malleable Iron Castings
ASTM A 501	(1993) Standard Specification for Hot-Formed Welded and Seamless Carbon-Steel Structural Tubing
ASTM A 563	(2000) Standard Specification for Carbon and Alloy Steel Nuts
ASTM A 563M	(2000) Standard Specification for Carbon and Alloy Steel Nuts (Metric)
ASTM A 570/A 570M	(1996) Standard Specification for Steel, Sheet and Strip, Carbon, Hot-Rolled, Structural Quality
ASTM B 136	(1984; R 1993) Standard Method for Measurement of Stain Resistance of Anodic Coatings on Aluminum
ASTM B 137	(1989) Standard Test Method for Measurement of Mass of Coating on Anodically Coated Aluminum
ASTM B 209/B 209M	(2001) Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
ASTM B 211	(1995) Standard Specification for Aluminum and Aluminum-Alloy Bar, Rod, and Wire
ASTM B 211M	(1995) Standard Specification for Aluminum and Aluminum-Alloy Bar, Rod, and Wire (Metric)
ASTM B 221/B 221M	(2000) Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Shapes and Tubes
ASTM B 244	(1979; R 1993) Standard Method for Measurement of Thickness of Anodic Coatings on Aluminum and of Other Nonconductive Coatings on Nonmagnetic

	Basis Metals with Eddy-Current Instruments
ASTM B 316/B 316M	(1995) Standard Specification for Aluminum and Aluminum-Alloy Rivet and Cold Heading Wire and Rods
ASTM C 509	(1994) Standard Specification for Elastomeric Cellular Preformed Gasket and Sealing Material
ASTM D 1730	(1967; R 1993) Standard Practices for Preparation of Aluminum and Aluminum-Alloy Surfaces for Painting
ASTM F 568M	(1998) Standard Specification for Carbon and Alloy Steel Externally Threaded Metric Fasteners

BUILDERS HARDWARE MANUFACTURERS ASSOCIATION (BHMA)

BHMA A156.1	(1988) Butts and Hinges
BHMA A156.16	(1989) Auxiliary Hardware
BHMA A156.18	(1987) Materials and Finishes
BHMA A156.4	(1992) American National Standards for Door Controls - Closers
BHMA A156.5	(1992) Auxiliary Locks & Associated Products
BHMA A156.6	(1994) Architectural Door Trim

INTERNATIONAL CODE COUNCIL (ICC)

ICC A117.1	(1998) American National Standards for Accessible and Usable Buildings and Facilities

U.S. GENERAL SERVICES ADMINISTRATION (GSA)

FS FF-B-588	(Rev D) Bolt, Toggle; and Expansion Sleeve, Screw
FS FF-S-325	(Int Amd 3) Shield, Expansion; Nail, Expansion; and Nail, Drive Screw (Devices, Anchoring, Masonry)
FS FF-W-84	(Rev A; Am 3) Washers, Lock (Spring)
FS TT-C-490	(Rev C; Am 2) Cleaning Methods for Ferrous Surfaces and Pretreatments for Organic Coatings

FS TT-C-494 (Rev B; Notice 1) Coating Compound, Bituminous, Solvent Type, Acid Resistant

UNDERWRITERS LABORATORIES (UL)

UL Bld Mat Dir (1999) Building Materials Directory

1.2 PERFORMANCE REQUIREMENTS

1.2.1 Allowable Design Stresses

Aluminum-Alloy framing member allowable design stresses shall be in accordance with AA SAS-30 for the specified aluminum alloy.

Hot-rolled Structural Steel member allowable design stresses and design rules shall be in accordance with AISC 350 for the specified structural steel.

Cold-formed light-gage steel structural member allowable design stresses and design rules shall be in accordance with AISI SG-671, for the specified structural-steel Sheet and Strip.

1.2.2 Design Wind Load

****

NOTE: A design wind load of 15 pounds per square foot 718 pascal is to be assumed by the aluminum door and frame manufacturer when nothing greater is specified.

****

[Design wind load shall be [15] [30] [35] pounds per square foot. [718] [1436] [1675] pascal.]

1.2.3 Structural Requirements

Doors and frames shall be designed to withstand the specified design wind load acting normal to the plane of the entrance wall either inward or outward.

Deflection of any metal framing member in a direction normal to the plane of the entrance wall, when the glazed entrance is subjected to the specified wind pressure, shall not exceed 1/175 of the clear span of the member or 3/4 inch, 19 millimeter, whichever value is the lesser.

Deflection of any metal member in a direction parallel to the plane of the entrance wall, when the metal member is carrying its full design load, shall not exceed 75 percent of the design clearance dimension between that member and the glass, sash, panel, or other part immediately below it.

1.2.4 Provisions for Thermal Movement

Doors and frames shall be designed to provide for expansion and contraction

of the component parts caused by an ambient temperature range of 0 to 100 degrees F minus 18 to 38 degrees C without causing buckling, opening of joints, overstressing of fasteners, or other harmful effects.

1.3 SUBMITTALS

****

NOTE: Review submittal description (SD) definitions in Section 01330, "Submittal Procedures," and edit the following list to reflect only the submittals required for the project. Submittals should be kept to the minimum required for adequate quality control. Include a columnar list of appropriate products and tests beneath each submittal description.

****

The following shall be submitted in accordance with Section 01330, "Submittal Procedures," in sufficient detail to show full compliance with the specification:

SD-02 Shop Drawings

Fabrication drawings for the following items shall be in accordance with the paragraph entitled, "Fabrication," of this section.

Finish Hardware
Aluminum Doors
Frames

SD-02 Shop Drawings

Installation drawings shall include the following information:

Door and frame locations in the building, layout and elevations, dimensions, shapes and sizes of members, thicknesses of metals, types and locations of shop and field connections, details of anchorage to other construction, method of glazing, and other pertinent construction and erection details.

Welds shall be in accordance with AWS A2.4 welding symbols.

Location and details of materials that are to be embedded in cast-in-place concrete and masonry construction.

A finish hardware schedule indicating type, quantity, manufacturer's name, catalog number, location, and finish.

Finish Hardware
Aluminum Doors
Frames

SD-03 Product Data

Manufacturer's catalog data shall be submitted for the following items:

Aluminum Doors
Paint Materials
Glazing Materials
Finish Hardware
Installation Materials
Thresholds
Frames
Weatherstripping

SD-04 Samples

Contractor shall submit the following samples:

An Aluminum Finish for exposed-to-view surfaces, approximately 3-inches wide by 6-inches75 millimeter wide by 150 millimeter long, to illustrate the aluminum producer's standard color and appearance range.

Preformed Glazing Gaskets, full size by 12 inches long.

Anchorage Devices and Fasteners, one full size of each type to be used in the work.

Lock Cylinders, one full size.

After approval, full size samples may be used in the construction, provided each is clearly identified and its location is recorded.

SD-05 Design Data

Design analysis and calculations for the following items shall indicate the allowable design loads as specified in the paragraph entitled, "Performance Requirements," of this section.

Aluminum Doors
Frames
Aluminum Alloy
Structural Steel
Sheet and Strip

SD-06 Test Reports

Test reports shall be in accordance with the paragraph entitled, " Finishes, Except Hardware," of this section, for anodic coating tests.

SD-07 Certificates

Certificates shall be submitted for the following items showing conformance with referenced standards contained in this section.

Metals for Fabrication
Paint Materials
Glazing Materials
Finish Hardware
Installation Materials

SD-08 Manufacturer's Instructions

Preventive Maintenance and Inspection for the following shall be in accordance with the paragraph entitled, "Finishes, Except Hardware," of this section.

Cleaning Materials
Application Methods

SD-10 Operation and Maintenance Data

Operation and maintenance manuals shall be submitted for the following items:

Finish Hardware
Aluminum Doors
Frames

1.4 QUALIFICATIONS FOR WELDING WORK

****
NOTE: If Section 05096, "Welding Aluminum Construction," is not included in the project specification, applicable requirements therefrom should be inserted and the following paragraph deleted.
****

[Section 05096, "Welding Aluminum Construction," applies to work specified in this section.]

[Welding processes shall be in accordance with AWS D1.1/D1.1M. Contracting Officer reserves the right to require that test specimens be made in the presence of an authorized representative and that such test specimens be tested by an approved laboratory.

Welders shall have been qualified by tests in accordance with AWS D1.1/D1.1M. In addition to the above requirements, tests shall be performed on test pieces in positions and with clearances equivalent to those actually encountered in construction. When a test weld fails to meet requirements, an immediate retest of two test welds shall be made, and each test weld shall pass. Failure of the retest shall require that the welder be retested after further practice or training and that a complete set of test welds be made.]

1.5 APPROVING AUTHORITY

****
NOTE: Delete the paragraph heading and the following paragraph when field welding of steel is not required.
****

References to the need for approval in AWS D1.1/D1.1M shall mean approval by the Contracting Officer, and all references to the Building Commissioner shall mean the Contracting Officer.

1.6 DELIVERY, HANDLING, AND STORAGE

Doors, frames, and accessories shall be protected from damage during handling, transportation, and at the job site. Materials shall be stored at the site under cover on wood blocking or on suitable floors.

Packaged materials shall be stored in their original, unopened packages.

1.7 FIELD MEASUREMENTS

Field measurements shall be taken prior to the preparation of drawings and fabrication.

PART 2 PRODUCTS

2.1 METALS FOR FABRICATION

2.1.1 Aluminum-Alloy Extrusions

Extrusions shall conform to ASTM B 221/B 221M.

****
NOTE: Delete the following paragraph when an anodic coating with integral color is required.
****

[Alloy and temper shall be 6063-T5.]

****
NOTE: Delete the following paragraph when an anodic coating with integral color is not required.
****

[Alloy and temper shall be that recommended by the aluminum producer for the specified anodic coating with integral color and shall have mechanical properties equal to or exceeding those of 6063-T5.]

Sheets and plates shall conform to ASTM B 209/B 209M, Alloy 5005, and Temper H16.

2.1.2 Structural Steel

Hot-rolled shapes, plates, and bars shall conform to ASTM A 36/A 36M.

Hot-formed tubing shall conform to ASTM A 501.

Sheet and strip for cold-formed light gage structural members shall conform to ASTM A 570/A 570M, Grade 33.

2.1.3 Metals for Fasteners

Metals for fasteners shall be a type recommended by the door manufacturer, or as follows:

Aluminum-alloy bolts and screws from rod conforming to ASTM B 211, Alloy 2024 and Temper T351

Aluminum-alloy nuts from rod conforming to ASTM B 211, Alloy 6061 and Temper T6

Aluminum-alloy washers from sheet conforming to ASTM B 209/B 209M, Alloy 2024 and Temper T4

Aluminum-alloy rivets from rod or wire conforming to ASTM B 316/B 316M, Alloy 6053 and Temper T61

Aluminum-alloy bolts and screws from rod conforming to ASTM B 211M, Alloy 2024 and Temper T351

Aluminum-alloy nuts from rod conforming to ASTM B 211M, Alloy 6061 and Temper T6

Aluminum-alloy rivets from rod or wire conforming to ASTM B 316/B 316M, Alloy 6053 and Temper T61

Corrosion-resistant steel fasteners from corrosion-resistant chromium-nickel steel, Type [302] [303] [304] [305] [316], form and condition best suited for the work

2.2 PAINT MATERIALS

Shop paint for aluminum shall conform to FS TT-C-494, Type II, bituminous solvent type.

Shop paint for steel shall be the manufacturer's standard rust-inhibiting primer.

2.3 GLAZING MATERIALS

Preformed Glazing Gaskets shall be elastomeric compression type, extruded to shape with factory-made tight fitting corners to suit the type of flush glazing and glass size.

Material shall conform to ASTM C 509.

2.4 FINISH HARDWARE

****
NOTE: Finish hardware items that are not mortised or concealed in doors and frames, such as floor- or wall-mounted door holders, are specified in Section 08711, "Hanging Hardware."
****

2.4.1 Checking Floor Hinges

****
NOTE: Delete the paragraph heading and the following paragraphs when overhead door closers are required. Floor hinges are recommended for entrance doors having a frequency of use exceeding 400 cycles per day.
****

Floor hinges shall be liquid-controlled, single-acting, offset-pivot operation with top pivots, of a size and hand best suited for the door weight and opening, conforming to BHMA A156.4, Type C06042, intermediate pivot C07321, modified with positive stops and back-check and with selective holdopen. Closers shall be the product of one manufacturer.

****
NOTE: Delete the following paragraph when water and freezing will not be a problem.
****

Floor hinges shall be provided with cement boxes. Floor plates shall be corrosion-resistant steel or bronze, as required to match the door finish. Plates shall be omitted where a threshold covers the cement box.

Floor hinges for exterior doors shall be sealed for protection from the weather.

2.4.2 Overhead Concealed Door Closers

****
NOTE: Delete the paragraph heading and the following paragraph when checking floor hinges or overhead surface-mounted door closers are required. Overhead frame must be of an adequate size to receive the closer mechanism concealed therein. Concealed overhead door closers are recommended for entrance doors having a frequency of use less than 400 cycles per day.
****

Closers shall be liquid-controlled with back-check, double-acting, center-pivot operation, having the closer mechanism concealed in the overhead frame, without holdopen, with bottom pivot, of the size best

suited for the door weight and opening, conforming to BHMA A156.4, Type C05062. Closers shall be the product of one manufacturer.

2.4.3 Overhead Surface-Mounted Door Closers

****

NOTE: Delete the paragraph heading and the following paragraphs when checking floor hinges or overhead concealed door closers are required. Overhead surface-mounted door closers are recommended for entrance doors having a frequency of use less than 400 cycles per day. These closers should not be exposed to the weather; for such locations either weather-sealed checking floor hinges or overhead concealed door closers are recommended.

****

[Surface-mounted door closers shall be liquid-controlled, rack-and-pinion construction, of a size best suited for the door weight and opening, conforming to BHMA A156.4, Type C02012. Closers shall be the product of one manufacturer.]

[Surface-mounted door closers shall be liquid-controlled, rack-and-pinion construction, of a size best suited for the door weight and opening, conforming to BHMA A156.4, Type C02011. Closers shall be the product of one manufacturer.]

Closer arms and mounting brackets shall be provided as required. Drop plates shall be provided, sized for the door stile dimension.

2.4.4 Butt Hinges

****

NOTE: Delete the paragraph heading and the following paragraph when pivots instead of butt hinges are required.

****

Hinges shall be the full-mortise, template, extra-heavy, ball bearing, five-knuckle type with button tips, conforming to BHMA A156.1, Type A2111, size [5 by 4] inches 130 by 100 millimeter (nominal)[_____]. Hinges for exterior out-swinging doors shall have pins that cannot be removed when the door is in the closed position. Hinges shall be the product of one manufacturer.

2.4.5 Pivot Hinges

****

NOTE: Delete the paragraph heading and the following paragraph when butt hinges instead of pivots are required.

****

Pivots shall be full-mortised, template, ball bearing, vertical-adjustment type of cast or forged high-strength bronze conforming to BHMA A156.1, Type A1711. Thrust loads and radial loads shall be carried by ball bearings. Leaves shall be swaged to provide 1/16 inch 1.5 millimeter of clearance between the door and the frame. Pivots shall be the product of one manufacturer.

2.4.6 Door Pulls

****
NOTE: Delete the paragraph heading and the following paragraph when the door manufacturer's standard door pulls are not required. Specify the door manufacturer's catalog number when custom door pulls are required.
****

Door pulls shall be extruded aluminum and of the door manufacturer's standard push-pull plate type.

2.4.7 Pushbars

****
NOTE: Delete the paragraph heading and the following paragraphs when panic exit devices are required.

Delete the following paragraph when the door manufacturer's standard single bar pushbars are not required.
****

Pushbars shall be extruded aluminum and of the door manufacturer's standard single bar type.

****
NOTE: Delete the following paragraph when the door manufacturer's standard single bar pushbar with attached pushplate is not required. Specify the door manufacturer's catalog number when custom single bar pushplate pushbars are required.
****

Pushbars shall be extruded aluminum and of the door manufacturer's standard single bar type, with attached pushplate having design matching the door pull used.

2.4.8 Deadlocks

****
NOTE: Delete the paragraph heading and the following paragraph when panic exit devices are required.
****

Deadlocks shall be mortised, one-point maximum-security type. Backset dimensions, front shape, and hand shall be suitable for the door stile. Deadlock shall receive the lock cylinder specified, without modification.

2.4.9 Lock Cylinders

****
NOTE: If cylinders are not required for this project, delete the following paragraph and substitute appropriate requirements.
****

Cylinders complying with BHMA A156.5, shall encase interchangeable seven-pin tumbler cores. Temporary cores shall be provided and maintained for each cylinder during the construction period and removed when directed. Security cores will be installed by the Government.

2.4.10 Flush Bolts

****
NOTE: Delete the paragraph heading and the following paragraph when panic exit devices are required or when doors are single.
****

Flush bolts shall be the concealed-lever extension type with a cast-aluminum front plate, conforming to BHMA A156.16, Type [L04082] [L04092] convex face. Soffit and sill strikes shall be provided.

2.4.11 Pull Handles

****
NOTE: Delete the paragraph heading and the following paragraph when panic exit devices are not required.
****

Handles shall be extruded aluminum, door manufacturer's standard panic device pull handle.

2.4.12 Panic Exit Devices

****
NOTE: Delete the paragraph heading and the following paragraphs when panic exit devices are not required. Specified panic exit device is suitable for single doors or double doors without overlapping astragals.
****

Exit devices shall be the top- and bottom-locking type with vertical rods concealed in door stiles. Devices shall be listed in UL Bld Mat Dir and shall bear the UL label.

[Exit devices shall be in accordance with ICC A117.1 for handicap requirements.]

Soffit strikes, sill strikes, and dogging keys shall be provided.

2.4.13 Thresholds

[Thresholds shall be extruded aluminum for doors hung on offset pivots, width as indicated, with grooved tread, conforming to BHMA A156.4, Type [C08051] [C08091].]

[Thresholds shall be extruded aluminum for doors hung on center pivots, with grooved tread, conforming to BHMA A156.4, Type C08011.]

[Thresholds shall be extruded aluminum for doors hung on butt or pivot hinges, with grooved tread, conforming to BHMA A156.6, Type J601.]

2.4.14 Hardware Finishes

****
NOTE: Insert BHMA code number for required finishes for hardware, selected from Section 08710, "Door Hardware," paragraph entitled, "Finishes."
****

Finish designations are Builders' Hardware Manufacturer Association (BHMA) code numbers, and conform to BHMA A156.18.

****
NOTE: Delete the following paragraph when checking floor hinges or overhead concealed door closers are not required.
****

Door closing devices, exposed cover plates, arms, and pivots shall be BHMA Code [_____].

****
NOTE: Delete the following paragraph when overhead surface-mounted door closers are not required.
****

Butt or pivot hinges shall be BHMA Code [_____]. Finish of the cover enclosing the closer case shall be BHMA Code [_____]. Finish of closer arms, mounting brackets, and drop plates shall be BHMA Code [_____].

****
NOTE: Delete the following paragraph when panic exit devices are required.
****

Finish of door pulls, pushbars, deadlocks, lock cylinders, and flush bolts shall be the same as that specified for doors and frames.

****
NOTE: Delete the following two paragraphs when panic exit devices are not required.
****

Finish of door handles and lock cylinders shall be the same as that specified for doors and frames.

Panic exit devices shall be BHMA Code [_____].

2.4.15 Hardware Sets

Hardware sets shall be as follows:

****
NOTE: Delete the following when single-acting, offset-pivot-operating doors with checking floor hinges are not required.
****

1 Checking floor hinge with top and intermediate pivot, each leaf

1 Door pull, each leaf

1 Pushbar, each leaf

1 Deadlock, each active leaf

2 Lock cylinders, each active leaf

2 Flush bolts, each inactive leaf

1 Threshold, each door opening

****
NOTE: Delete the following when single-acting, center-pivot-operating doors with overhead concealed door closers are not required.
****

1 Overhead concealed door closer with a bottom pivot and door stop applied to the frame, each leaf

1 Door pull, each leaf

1 Pushbar, each leaf

1 Deadlock, each active leaf

2 Lock cylinders, each active leaf

2 Flush bolts, each inactive leaf

1 Threshold, each door opening

****
NOTE: Delete the following when single-acting, butt-hinge-operating doors with overhead surface-mounted door closers are not required.
****

1-1/2 Pairs of butt hinges, each leaf

1 Overhead surface-mounted door closer, each leaf

1 Door pull, each leaf

1 Pushbar, each leaf

1 Deadlock, each active leaf

2 Lock cylinders, each active leaf

2 Flush bolts, each inactive leaf

1 Threshold, each door opening

****
NOTE: Delete the following when single-acting, offset-pivot-operating doors with overhead surface-mounted closers are not required.
****

1 Set of pivot hinges (top and bottom), each leaf

1 Intermediate pivot

1 Overhead surface-mounted door closer, each leaf

1 Door pull, each leaf

1 Pushbar, each leaf

1 Deadlock, each inactive leaf

2 Lock cylinders, each active leaf

2 Flush bolts, each inactive leaf

1 Threshold, each door opening

****
NOTE: Delete the following when single-acting, offset-pivot-operating doors with checking floor hinges and panic exit devices are not required.
****

1 Checking floor hinge with top pivot, each leaf

1 Intermediate pivot

1 Pull handle, each leaf

1 Panic exit device for exit and entrance operation, each active leaf

2 Lock cylinders, each active leaf

1 Panic exit device for exit only, each inactive leaf

1 Threshold, each door opening

****
NOTE: Delete the following when single-acting, center-pivot-operating doors with overhead concealed closers and panic exit devices are not required.
****

1 Overhead concealed door closer with bottom pivot and door stop applied to the frame, each leaf

1 Pull handle, each leaf

1 Panic exit device for exit and entrance operation, each active leaf

2 Lock cylinders, each active leaf

1 Panic exit device for exit only, each inactive leaf

1 Threshold, each door opening

****
NOTE: Delete the following when single-acting, butt-hinge-operating doors with overhead surface-mounted door closers and panic exit devices are not required.
****

1-1/2 Pairs of butt hinges, each leaf

1 Overhead surface-mounted door closer, each leaf

1 Pull handle, each leaf

1 Panic exit device for exit and entrance operation, each active leaf

2 Lock cylinders, each active leaf

1 Panic exit device for exit only, each inactive leaf

1 Threshold, each door opening.

****

NOTE: Delete the following when single-acting, offset-pivot-operating doors with overhead surface-mounted door closers and panic exit devices are not required.

****

1 Set of offset pivots (top and bottom), each leaf

1 Intermediate offset pivot, each leaf

1 Overhead surface-mounted door closer, each leaf

1 Pull handle, each leaf

1 Panic exit device for exit and entrance operation, each active leaf

2 Lock cylinders, each active leaf

1 Panic exit device for exit only, each inactive leaf

1 Threshold, each door opening

2.5 FABRICATION

2.5.1 Workmanship

Metal parts shall be accurately formed. Joints, except those designed to accommodate movement, shall be accurately fitted and rigidly assembled.

Welding shall be in accordance with AWS D1.1/D1.1M and shall be done with filler metals and by methods recommended by the producer of the metal being welded. Welds behind finished surfaces shall cause no distortion or discoloration on the exposed side. Welded joints shall be cleaned of all welding flux and dressed on all exposed and contact surfaces.

Insofar as practical, fitting and assembly of the work shall be done in the manufacturer's plant. Work that cannot be permanently factory assembled shall be marked before shipment for proper assembly at the site.

2.5.2 Preparation for Finish Hardware

Preparations for mortised and concealed hardware shall be done at the factory and shall include cutouts, recesses, mortises, reinforcing, drilling, and tapping to receive the specified hardware sets. Preparations for hardware shall be made to the template of the manufacturer of each hardware item. Where concealed closers and other mechanisms are required, the necessary space, cutouts, reinforcement, and provisions for secure fastening shall be made. Where butt or pivot hinges are required, doors and frames shall be reinforced with backing plates to ensure adequate

strength of the fastening.

2.5.3 Protection of Aluminum from Dissimilar Materials

Surfaces that will come in contact with dissimilar metals, masonry, concrete, or wood shall be shop primed.

Surfaces shall be prepared in conformance with ASTM D 1730, Type B, Method [2] [3].

Surfaces shall be given one shop coat of paint which shall be applied to dry, clean surfaces to provide a continuous minimum dry-film thickness of 1.5 mils (0.0015 inch). 0.038 millimeter.

2.5.4 Shop-Painting Steel

Surfaces of steel concealed in doors and frames shall be shop primed.

Prior to the application of the shop coat of paint, scale, rust, and other deleterious materials shall be removed in accordance with FS TT-C-490.

Surfaces shall be given two coats of paint; the second coat shall have a color different from the first coat. Paint shall be applied to provide a continuous minimum dry-film thickness of 1.5 mils (0.0015 inch) 0.038 millimeter for the first coat and 1 mil (0.0010 inch) 0.025 millimeter for the second coat.

2.5.5 Aluminum Doors

****

NOTE: Door thicknesses of 1-3/4 inches 44 millimeter and door heights of 7 feet 2200 millimeter are standard with most aluminum door manufacturers. Door size and hand must be indicated on the drawings.

****

Doors shall be swing type, full glazed, stile-and-rail construction with medium stile, of the size indicated.

Stiles and rails shall be fabricated of aluminum-alloy tubular extrusions having a wall thickness not less than 0.125 inch. 3.1 millimeter.Corners shall be joined by both concealed welding and mechanical fastening. Corner connections shall be accurately milled to a hairline watertight joint.

Single swing doors shall have not more than 3/32-inch 2.4 millimeter clearance at jambs and heads, 3/16-inch 4.7 millimeterclearance at meeting edges of pairs of doors, and 1/2-inch 13 millimeter clearance at the bottom. Dimensions are nominal and subject to the manufacturer's tolerances. Lock edges of doors shall provide the proper operating clearance.

Glazing moldings shall be fabricated of aluminum-alloy extrusions with wall thicknesses not less than 0.050 inch. 1.3 millimeter. Moldings shall be the snap-in flush glazing type with preformed glazing gasket, sized to

receive the type and thickness of the glass. Moldings on the exterior face of doors shall be the nonremovable type without exposed screws. Moldings shall be carefully fitted and joined at corners.

2.5.6 Frames

****

NOTE: Flush glazed frames, 1-3/4 inches 44 millimeter wide by 4-1/2 inches 114 millimeter deep are stock with most aluminum door manufacturers. Frame arrangements that are standard with most aluminum door manufacturers include door frame only; door frame with sidelights; door frame with fixed transom; and door frame with sidelights and fixed transom. Size and arrangement of framing members must be indicated on the drawings.

****

Frames shall be of the section dimensions and arrangements indicated.

Frames shall be fabricated of aluminum-alloy extrusions with a wall thickness of not less than 0.125 inch. 3.1 millimeter. Frame joints shall be sealed to prevent leakage. Door stops applied to the frames shall be secured with concealed fasteners. Anchors shall be provided for securing the frames to building construction. Sizes, shapes, and methods of anchoring shall be as detailed on the approved drawings.

Structural steel members required for the reinforcement of framing sections shall be provided with the frames and shall be hot-rolled shapes, hot-formed tubing, or cold-formed light-gage steel. Reinforcement shall be concealed inside the frame members.

Glazed openings in frames shall be designed for flush glazing. Glazing moldings and preformed glazing gaskets shall be as specified for doors.

2.5.7 Finishes, Except Hardware

****

NOTE: Delete the following paragraph when an integral color anodic coating is required. The specified finish is standard with most aluminum door manufacturers.

****

Preventive Maintenance and Inspection for the aluminum manufacturer's recommended Cleaning Materials and Application Methods shall be submitted, including detrimental effects to the aluminum finish when improperly applied.

Aluminum Finish for exposed-to-view aluminum surfaces of the doors and frames shall be polished frosted finish with Class II clear anodic coating. Finish shall be a smooth specular buffed mechanical finish followed by a medium matte chemical-etch finish and Architectural Class II (0.4- to 0.7-mil 0.010 to 0.018 millimeter thickness) anodic coating producing a

natural aluminum color. Finish shall conform to M12-C22-A31 as defined in AA 45.

****

NOTE: Delete the following paragraphs when a clear anodic coating is required.

****

Aluminum finish for exposed-to-view aluminum surfaces of doors and frames shall be polished frosted finish with integral-color anodic coating.

Smooth specular buffed mechanical finish shall be followed by nonetching inhibitive alkaline cleaning, medium matte chemical etch finish, and an Architectural Class I (0.7-mil 0.02 millimeter and greater thickness) anodic-coating-producing integral-color finish. Finish shall conform to M21-C12-C22-A42 as defined in AA 45. Colors shall be:

[Light bronze]

[Medium bronze]

[Dark bronze]

[Black]

Finish color and appearance shall match that of the sample approved for use in the project within the aluminum producer's standard color range.

Anodic coating on aluminum shall be tested for thickness in accordance with ASTM B 244.

Anodically coated aluminum shall be tested for the weight of the coating in accordance with ASTM B 137.

Resistance of anodically coated aluminum to staining by dyes shall be tested in accordance with ASTM B 136.

2.5.8 Hardware Locations

Hardware locations shall be as follows:

HARDWARE ITEM	LOCATION
Door handles	Centerline of grip 42 inches above the floor
Door pulls	Top fastening 45 inches above the floor
Pushbars, single	Centerline 45 inches above the floor
Deadlocks	Centerline of strike 60 inches above the floor
Panic exit	Centerline of strike 40-5/16 inches

HARDWARE ITEM	LOCATION
devices	above the floor
Top flush bolt	Centerline of front plate 72 inches above the floor
Bottom flush bolt	Centerline of front plate 12 inches above the floor
Top butt hinges	11-3/4 inches from the rabbet section of the head of the frame to the centerline of the hinge
Bottom butt hinges	13 inches from the finished floor to the centerline of the hinge
Intermediate butt hinges	Equally spaced between the top and bottom butt hinges
Pivot hinges (top, bottom, and intermediate)	In accordance with the pivot manufacturer's printed instructions

HARDWARE ITEM	LOCATION
Door handles	Centerline of grip 1067 millimeter above the floor
Door pulls	Top fastening 1143 millimeter above the floor
Pushbars, single	Centerline 1143 millimeter above the floor
Deadlocks	Centerline of strike 1525 millimeter above the floor
Panic exit devices	Centerline of strike 1025 millimeter above the floor
Top flush bolt	Centerline of front plate 1830 millimeter above the floor
Bottom flush bolt	Centerline of front plate 310 millimeter above the floor
Top butt hinges	300 millimeter from the rabbet section of the head of the frame to the centerline of the hinge
Bottom butt hinges	330 millimeter from the finished floor to the centerline of the hinge
Intermediate butt hinges	Equally spaced between the top and bottom butt hinges

HARDWARE ITEM	LOCATION
Pivot hinges (top, bottom, and intermediate)	In accordance with the pivot manufacturer's printed instructions

2.5.9 Weatherstripping

Exterior doors shall be provided with weatherstripping at heads, jambs, and meeting stiles.

Weatherstripping shall be silicone treated wool pile inserted in a corrosion-resistant steel or extruded aluminum-alloy housing. Weatherstripping at meeting stiles of pairs of doors shall be adjustable. Weatherstripping shall be mortised into the door edges, or frame, or both, as required to suit the conditions. Weatherstripping shall be designed for easy removal and replacement.

2.6 INSTALLATION MATERIALS

****

NOTE: Concrete inserts should be used for fastening the work to cast-in-place concrete construction when the anchorage device will be subjected to direct pull-out loadings. Inserts must be indicated on the drawings.

****

2.6.1 Threaded-Type Concrete Inserts

Inserts shall be galvanized ferrous castings having enlarged bases with not less than two nailing lugs, length not more than the thickness of the concrete less 3/4 inch, 20 millimeter and internally threaded to receive 3/4-inch 20 millimeter diameter machine bolts. Castings shall conform to ASTM A 47/A 47M, Grade [32510] [35018,] [Grade 22010,]. Inserts shall be galvanized in accordance with ASTM A 153/A 153M after fabrication.

Inserts shall not be removable when embedded in 3,000-pound per square inch (psi) 20 megapascal concrete and subjected to a 10,000-pound 44482 newton tension load test in an axial direction, nor shall the concrete show any evidence of failure attributable to installation of the anchorage device itself.

2.6.2 Wedge Concrete Inserts

Inserts shall be galvanized box-type ferrous castings with an integral loop at the back of the box and designed to accept 3/4-inch 20 millimeter diameter bolts having special wedge-shaped heads. Castings shall conform to ASTM A 47/A 47M, Grade 32510 or 35018, or ASTM A 27/A 27M, Grade U-60-30. Inserts shall be galvanized after fabrication in accordance with ASTM A 153/A 153M.

Inserts shall not be removable when embedded in 3,000-psi 20684 kilopascal

concrete and subjected to a 16,000-pound 71172 newtontension load test in an axial direction, nor shall the concrete show any evidence of failure attributable to installation of the anchoring device itself.

Carbon-steel bolts having special wedge shape heads, nuts, washers, and shims, galvanized in accordance with ASTM A 153/A 153M, shall be provided.

2.6.3 Slotted Concrete Inserts

Inserts shall be the galvanized, pressed-steel plate, welded construction, box type, with slots designed to receive 3/4-inch 20 millimeterdiameter square-head bolts and to provide lateral adjustment of the bolt. Length of the insert body less the anchorage lugs shall be not less than 4-1/2 inches. 114 millimeter. Inserts shall be provided with knockout covers. Steel plate shall be not less than 1/8 inch 3 millimeter thick, conforming to ASTM A 283/A 283M, Grade C. Inserts shall be galvanized in accordance with ASTM A 123/A 123M after fabrication.

Inserts shall not be removable when embedded in 3,000-psi 20684 kilopascal concrete and subjected to a 6,000-pound 26690 newtontension load test in an axial direction, nor shall the concrete show any evidence of failure attributable to installation of the anchoring device itself.

2.6.4 Masonry-Anchorage Devices

****

NOTE: Masonry anchorage devices should be used only for fastening the work to solid masonry and concrete-in-place construction when the anchorage device will not be subjected to direct pull-out loadings nor to vibration. Masonry anchorage devices should be used only for nonvibratory shear loads.

****

Devices shall be expansion shields conforming to FS FF-S-325, group, type, and class as follows:

Shields for machine screws 1/4-inch and smaller shall be lead group, head-out embedded nut type, single unit class, conforming to Group I, Type 1, Class 1.

Shields for standard steel bolts and machine screws larger than 1/4-inch shall be lead group, head-out embedded nut type, multiple unit class, conforming to Group I, Type 1, Class 2.

Shields for machine screws 6 millimeter and smaller shall be lead group, head-out embedded nut type, single unit class, conforming to Group I, Type 1, Class 1.

Shields for standard steel bolts and machine screws larger than 6 millimeter shall be lead group, head-out embedded nut type, multiple unit class, conforming to Group I, Type 1, Class 2.

2.6.5 Toggle Bolts

****

NOTE: Toggle bolts should be used for fastening the specified work to hollow masonry and stud partition construction.

****

Toggle bolts shall be tumble-wing type, class and style best suited for the work, conforming to FS FF-B-588, Type II.

2.6.6 Standard Threaded Fasteners

Standard threaded fasteners shall be as follows:

Standard steel bolts: Regular hexagon head, low-carbon steel, coarse-thread series, conforming to ASTM A 307.

Nuts: Plain hexagon, regular style, carbon steel, conforming to ASTM A 563.

Standard steel bolts: Regular hexagon head, low-carbon steel, coarse-thread series, conforming to ASTM F 568M.

Nuts: Plain hexagon, regular style, carbon steel, conforming to ASTM A 563M.

Plain washers: Round, general assembly purpose grade, carbon steel, conforming to ANSI B18.22.1. ANSI B18.22M.

Lockwashers: Helical-spring, carbon steel, of the style best suited for the work, conforming to FS FF-W-84, Class A.

2.6.7 Electrodes for Welding Steel

Electrodes for welding steel by the manual shielded metal-arc welding process shall meet the requirements of AWS D1.1/D1.1M and shall be covered mild-steel electrodes conforming to AWS A5.1, E60 series.

PART 3 EXECUTION

3.1 INSTALLATION

3.1.1 Doors, Frames and Accessories

Doors, frames, and accessories shall be installed in accordance with the approved shop drawings and descriptive data.

3.1.2 Materials Embedded in Other Construction

Materials such as cement boxes for checking floor hinges, concrete inserts, and anchor bolts, which are to be embedded in cast-in-place concrete and masonry construction, shall be delivered to the project site in time to be installed before the start of the other construction. Setting drawings,

templates, instructions, and directions shall be provided for the installation of the embedded materials.

3.1.3 Fastening to Construction-in-Place

Anchorage devices and fasteners shall be provided where necessary for fastening the specified work to construction in place and shall include threaded fasteners for concrete inserts embedded in cast-in-place concrete, masonry anchorage devices and threaded fasteners for solid masonry and concrete in place, toggle bolts for hollow masonry and stud partitions, and connections for structural steel. Fastening shall be provided as specified. Fastening to wood plugs in masonry or concrete in place is not permitted.

3.1.4 Setting Masonry Anchorage Devices

Devices shall be set in masonry or concrete in place in accordance with the manufacturer's printed instructions. Holes shall be the recommended depth and diameter and shall be drilled using the drill recommended by the manufacturer of the particular anchorage device used. Drilled holes shall be left rough, not reamed, and free from drill dust.

3.1.5 Field Welding Steel, Touchup Painting

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NOTE: Delete the paragraph heading and the following paragraphs when field welding of steel is not required.

****

Procedures of manual shielded metal-arc welding, the appearance and quality of welds made, and the methods used in correcting welding work shall conform to AWS D1.1/D1.1M.

After completion of welding, field welds and scarred surfaces on steel work and on adjacent ferrous-metal surfaces shall be touchup painted. Before start of touchup painting, weld scars, bruises, abrasions, and rust spots shall be wire brushed and solvent cleaned. Paint used for touchup painting shall be the same as that used for shop painting steel.

3.1.6 Installation Tolerances

Doors and frames shall be installed in a manner not to exceed the following limits of tolerance:

Deviation in location from that indicated on the drawings	Plus or minus 1/4 inch
Deviation from the plumb or horizontal:	
In 12 feet	Not more than 1/8 inch
In 24 or more feet	Not more than 1/4 inch

Offset from true alignment at joints between members in line end-to-end	Not more than 1/16 inch
Deviation in location from that indicated on the drawings	Plus or minus 6 millimeter
Deviation from the plumb or horizontal:	
In 3660 millimeter	Not more than 3 millimeter
In 7.3 or more meter	Not more than 6 millimeter
Offset from true alignment at joints between members in line end-to-end	Not more than 1.5 millimeter

3.1.7 Placing Frames

Supporting members, including materials embedded in other construction, shall be completely in place before placing frames. Framing members shall be installed plumb, level, and in alignment within the limits of the installation tolerances specified. Temporary supports and bracing shall be provided as required to maintain the position, stability, and alignment of the framing members while they are being permanently connected.

3.1.8 Door Installation

Doors shall fit accurately in frames within the specified door clearances.

3.1.9 Finish Hardware Installation

Contractor shall drill and tap as required for the application of surface-mounted finish hardware. True position shall be located by template to ensure accurate placement. Hardware items shall be installed in accordance with the manufacturer's printed instructions.

Thresholds shall be bedded in mastic and secured with corrosion-resistant steel flathead machine screws and lead expansion shields.

After installation is completed, hardware shall be adjusted and lubricated to ensure proper performance.

3.2 CLEANING

Upon completion of the installation, work shall be cleaned to remove all mastic smears and other foreign materials.

Before final acceptance, exposed-to-view aluminum surfaces shall be thoroughly washed with clean water and soap and rinsed with clean water. Acid solutions, steel wool, or other harsh abrasives shall not be used. Stains that remain after washing shall be removed or the finish restored in accordance with the aluminum producer's recommendations.

3.3 FINAL ADJUSTMENT

Before final acceptance, finish hardware shall be checked and readjusted as required to ensure proper operation.

3.4 ACCEPTANCE PROVISIONS

Doors and frames will be rejected for, but not limited to, any of the following deficiencies:

Exposed-to-view aluminum surfaces having color and appearance that are outside the color and appearance range of the approved samples for aluminum finish

Doors and frames not conforming to the requirements for installation tolerances and door clearances specified

Hardware that is not complete and operating properly

Doors and frames having stained, discolored, abraded, or otherwise damaged exposed-to-view aluminum surfaces that cannot be restored by cleaning or repairing

3.5 REPAIR OF DEFECTIVE WORK

Defective work shall be removed and replaced with new at no additional cost to the Government.

-- End of Section --